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APPLICATION FOR PATENT

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MULTIPLE USE HANDLE SUPPORT FOR DISTRIBUTING FORCES

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5 **Related Applications**

This application is a conversion of provisional application serial no. 60/345,688, filed December 31, 2001 and of earlier filed provisional application serial no. 60/286,436 filed, April 26, 2001.

10 **Background of the Invention**

Many tools and appliances are used while being supported by one hand of the user. Such tools as brushes, paint rollers, window squeegees, scrapers, spray wands, certain brooms, shovels, rakes and the like, use elongated poles as part of their structure. It is common knowledge that when so used, such devices place a great deal of strain on the hand and wrist of the user. The long lever action of such tools amplifies the force required to be exerted by the hand and wrist of the user in order to exert a force at the working end. Torsional, lateral and axial forces must be transmitted from the hand and wrist to the device, causing awkwardness, fatigue, and sometimes injury.

25 The prior art is replete with efforts to distribute the forces experienced in the use of hand tools and appliances from the hand and wrist to the forearm, in order to relieve the pressure and strain on the wrist itself. A considerable number of prior art devices couple a handle with a brace of some sort which surrounds the forearm. Hence cuffs, bands, cradles, etc. are

linked by a rigid structure to the handle. The handle is either integrally formed with the device or is equipped with a coupling device for more universal use. The efficacy of the prior art devices is generally defeated by the varying size and structure 5 of the user, the diversity of stresses distributed to and from the tool, or discomfort experienced by the user. In addition, there is generally difficulty in installing the support on the forearm, which often requires the use of the other hand.

10 Typical structures of the prior art are shown in U.S. Patent Nos. 5,445,479; 5,564,451; and 5,890,259. Each of these patents describe devices which employ an upright handle attached by a rigid bar or bars extending up the arm to a cuff. In each instance the cuff circumscribes the arm in a single transverse plane to engage the upper arm and distribute forces. The devices of '451 and '479 patents provide adjustable straps to accommodate different sizes, while the '259 patent appears to be one size fits all. U.S. Patent No. 5,156,429 is an "S" shaped bar which, in the preferred embodiment, extends from a handle up 20 the arm to provide engagement on several sides of the arm. By not fully enclosing the arm, it can accommodate different sizes and also makes it easier to mount on the arm.

25 It is a purpose of this invention to provide a mechanism for distributing forces and stress exerted by and on the hand and wrist to the forearm. It is another purpose of this invention to provide a brace which is designed for comfortable use by the great majority of potential users without regard to diverse arm sizes. It is also a purpose of this invention to provide a

multipurpose handle which can be used in a wide variety of applications, in particular, those involving tools and appliances which have an elongated pole or shaft as part of their construction. Such devices are difficult to use effectively with one hand. It is also a purpose of this device to facilitate the installation and removal of the brace on the arm, so that it can be easily engaged without the use of the other hand, and without threading the hand and arm through a circular opening.

It is also a purpose of this invention to provide a multipurpose handle which can be used with hand tools such as power drills, nail guns, paint sprayers, etc., which may include a "pistol grip" as part of existing design and common use.

Summary of the Invention

The handle support of this invention may be molded or cast from a light weight material such as plastic or aluminum, or other suitable material. It has a series of integrally formed sections extending from a forward end to a rearward end. The forward end forms an attachment post to which some sort of a tool is removably secured by appropriate means. A grip portion extends downward from the attachment post at an angle to allow the grip to be conveniently held by the user's hand. In the preferred embodiment, a generally planar seat portion, which may be contoured to the shape of the wrist, extends rearward from the grip portion at an obtuse angle to form a forward leaning Z-shaped front end to the handle support of this invention. A brace portion extends rearward from the planar seat in a helical

form which varies in pitch and increases in radius of curvature from front to rear. The brace portion thereby circumscribes an open space which is substantially conical in form. The handle support of this invention, therefore, includes a portion which 5 forms a helical wrap for engagement with the arm and a portion which allows the removable attachment of a variety of tools. In this manner forces, exerted by or on the hand and wrist, are distributed over the interior surface of the helical brace portion as needed.

Description of the Drawing

The invention of this application is described in more detail below with reference to the drawing in which:

Figure 1a is a side view of the handle support of this invention in place on the arm of the user;

Figure 1b is a partial view of an alternate embodiment of the seat portion of the handle support;

Figure 2 is a perspective view of the handle support of this invention installed on the arm of the user;

20 Figure 3 is a view from the rearward end of the handle support of this invention;

Figure 4 is a view from the forward end of the handle support of this invention;

25 Figure 5a is a perspective view of an alternate embodiment of the invention; and

Figure 5b is an end view of the alternate embodiment of figure 5a.

Description of the Preferred Embodiment

As shown in figure 2, the handle support of this invention is a cast or molded, one piece rigid device constructed of a strong plastic material or light weight metal, such as aluminum. It 5 has a uniquely contoured body 1 extending from a forward end 6 in front of the hand of the user to a rearward end 9 near the elbow of the user. Body 1 is integrally formed of multiple sections. At its forward end 6 there is an attachment post 2 which extends rearward. The attachment post 2 may be a generally elongated cylindrically shaped section to which is fixed a coupling mechanism 14 at the forward most end 6. The coupling mechanism is designed to facilitate the attachment of the attachment post 2 to a shaft 17 of a tool (not shown). The coupling mechanism 14 could be a variety of configurations from a simple male fitting with coarse threads, as shown in figure 1a, to a female receptacle with a compression nut, to a keyless chock, or a special purpose chock, depending on the tool or appliance with which it is intended to be coupled. The attachment post 2 has a longitudinal axis 10. A coupling 20 mechanism 14, such as a female receptacle with a compression nut or a keyless chock, would facilitate the use of the handle support with a great variety of tools having cylindrical shaped handles, for example, a broom, rake, crutch, squeegee, ice scraper, paint roller and many others.

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Extending rearward from the attachment post 2, is a grip 3 which may be contoured for comfortably accommodating fingers and thumb. The grip 3 also is an elongated section and has a

longitudinal axis 12 which is oriented at an angle A with respect to the longitudinal axis 10 of the attachment post 2. The sections of the handle support of this invention will be described for convenience in terms of the upright orientation of 5 the handle support in which the axis 10 of the attachment post 2 is considered generally horizontal and the grip 3 extends downward with its axis 12 at an angle A to the axis 10. It has been found that angle A should be an acute angle to provide a comfortable orientation of the tool or appliance and to conform to the shape of the hand and wrist.

A generally planar seat portion 4 extends rearward from the grip 3 to form a contoured surface 7 for supporting engagement with the lower portion of the hand and wrist, as shown in figure 1a. As shown in figure 1b, the seat portion 4 may be contoured in a slightly curved shape 13 to enable the joint of the wrist to engage the surface and flex comfortably. This provides a support if needed for applying a force F1, as shown in figures 1a and 2. The plane of the seat forms an obtuse angle B with 20 the axis 12 of the grip 3. The angles A and B have a relationship which is substantially supplementary to form a forward leaning Z shaped portion of the handle support. An open area above the seat portion 4 accommodates the wrist joint of the user and permits a flexing of the joint from side to side 25 about an axis approximately parallel to axis 12, but rearward at the wrist joint, as shown in figure 2. The wrist joint is also free to flex up and down about axis 16 of the wrist joint. When it flexes down, it can bear on the contoured planar surface 7 of the seat 4, thereby forcing or pulling down the segment of the

helix over the top of the forearm, and locking in the forearm and wrist to the helix.

A rigid brace portion 5 extends from the seat 4 to the rearward end 9 of the body 1 in a substantially helical form having a varying pitch and sufficient length to surround the arm over the top and on at least two sides. Pitch of the helix 5, which is the distance between adjacent turns of the helix measured along a line parallel to its axis 11, decreases, as the helix extends rearward to end 9. Although a helix is generally associated with a cylindrical form, i.e., a straight line wrapped around a cylindrical form, the helix of this device, in the preferred embodiment, circumscribes a generally conical form in which the radius of curvature "r" of the brace portion 5 diminishes from the rearward end 9 to the seat portion 4. In this manner, the brace portion 5 defines an open area in the general shape of a cone having a longitudinal axis 11. The conical open area conforms generally to the shape of the human forearm. The brace portion 5 terminates in a straight downward section 15 at the rearward end 9. The short straight section 15 provides an opening to allow the convenient insertion of the arm during use of the handle support, without threading the arm and hand from the rear of the handle support, and without requiring the use of the other hand for adjustment of a cuff strap, or for support of the handle device during the insertion of the arm.

In the preferred embodiment, the helix extends in a clockwise sweep starting essentially at the inner side of the wrist. The helical brace would be effective if accomplished in the reverse,

i.e., extending in a counter clockwise sweep starting essentially at the outside of the wrist, according to the right arm shown in figure 2. It has been found that, although the handle of the preferred embodiment can be used on either arm, 5 the clockwise sweep around the inner arm is more suitable for right hands, while a counter clockwise sweep will be more comfortable for use in the left hand.

It is observed from the figures, that the handle support will provide supporting engagement with the arm of the user over a continuous surface 8 which touches the lower, upper, and sides of the arm of the user. This engagement may not occur simultaneously, but depending on the size of the arm of the user will occur as needed. This is because, even if the handle is loose on the user's arm, the contours of the handle support allow the user freedom to flex the wrist. This allows the hand to twist around the axis 12 of the grip 3 and also to flex about a horizontal axis 16 transverse to the longitudinal axis 11 of the handle support 1. Such movement will adjust the position 20 of the brace and seat to engage the surface of the arm in an area at which supporting transmission of the forces is most comfortable. In operation, the forces needed to be exerted on the working end of the tool are distributed about the contours of the seat and brace portions 4 and 5 respectively of the 25 handle support wherever it engages the arm. This is illustrated by force vectors $F_1 - F_4$, as shown in figures 1 and 2.

In some applications it may be advantageous to eliminate the seat section 4 so that the brace section 5 extends rearward

directly from the grip portion 2. In this alternative embodiment there may be no support for the bottom of the hand, but it would be less restrictive to movement of the hand if needed for a particular use. In this instance as shown in figure 5a and 5b, the helical shaped brace maybe extended further around the arm in order to provide support under the arm at the segment of the brace closest to the elbow.

The support of this invention could also be adapted for use as part of a hand held tool or appliance, part of which includes a grip. In such applications a handle support including a seat and brace or just a brace could be attached or integrally constructed with the grip to function as indicated above.

Although the open area circumscribed by the brace portion 4, is desirably in conical form, the parameters of the helix could be adjusted to define a different shape, including a cylindrical shape, which may advantageous for particular purposes.

It also may envisioned that it may be advantageous to connect the attachment post to a position on the grip that is at its lower end or between the ends of the grip.

In operation, the helical shape of the brace of the subject handle has an axis 11 which is approximately parallel to axis 10 of the attachment post. In the preferred embodiment, as shown on figure 4, the helix stops short of completing a full circle around the theoretical cone that is being traversed. The axis of a user's arm, with the support handle 1 installed, is in

general alignment with the axis of the cone, as shown in figure 2. Since the conical open area circumscribed by the helix is designed to be larger than the average wrist and forearm, the interior surface 8 of the helix will not engage the wrist and arm over its entire length at any one time. As forces are distributed, the wrist will flex to compensate for any clearance between the helical brace portion 5 and the arm. The flexing of the wrist will cause the axis of the arm to become slightly out of alignment with the axis 11 of the conical space, as shown by phantom lines 18 in figure 2, thereby causing engagement between the arm and the brace at different points along the length of the interior surface 8 of brace section 5 and at different points about the circumference of the arm. Engagement will occur according to the user's sense of comfort, as controlled by wrist flexure. It is observed from use, that the surface of engagement is dependent on the direction of forces exerted at the end of the shaft 17. This action also has the effect of compensating for size of the user's arm, namely, flexure of the wrist permits engagement of the arm within the brace section 5 in spite of clearances caused by smaller sized arms. When the wrist is flexed and the brace is engaged, the relationship of the brace to the wrist becomes locked, effectively transmitting forces away from the wrist to the point of engagement with the forearm.

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Therefore, the operation of the helically shaped brace 5 is considerably different than the operation of the cuffs of the prior art and results in improved comfort while efficiently distributing the forces involved to the arm to ease the burdens